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RESEARCH BULLETIN

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AN ACCOUNTABILITY DESIGN FOR SCHOOL SYSTEMS

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AN ACCOUNTABILITY DESIGN FOR SCHOOL SYSTEMS

Abstract

A comprehensive plan for accountability in elementary and secondary schools is described. The primary purpose of the accountability system is to promote student development. During the first phase of accountability, an assessment is made of student performance. Results can be expressed in terms of both the percentage of students scoring below minimum performance standards and the Student Development Index, a deviation measure of performance based on longitudinal student data. In the diagnostic phase a systematic study of process variables is initiated to identify those process variables that should become the focus of corrective action plans. Corrective action must then be taken. Suggestions for implementing the accountability system are also presented.

An Accountability Design for School Systems[1]

The word accountability means different things to different people. This ambiguity in the use of the word has undoubtedly contributed to the wide popularity of the term. If accountability is to be more than a slogan and become a useful plan for a school system, a carefully planned and comprehensive operational statement of the concept will be required.

This article proposes a working statement of the meaning of accountability for a school system. The principles and concepts that will be described are meant to apply to any reasonably large school system, ranging in size from several schools to hundreds of schools. This set of schools could include those within the same school district or it could be expanded to include schools from any number of school districts as long as the participating schools use the same data collection system.

The primary purpose of an accountability system is to promote student achievement. The system is built around the following four premises:

1. To the extent that each member of the school system has his responsibilities well-defined and is supplied with the necessary resources, he should be held accountable for carrying out these responsibilities within a rational and practical decision-making framework.
2. Changes within an educational system should occur gradually within a planned and reasonable time schedule. The proposed changes must be allowed to develop over a long enough period of time to allow them a fair trial to produce the desired results.

3. The school staff should be held accountable for educating the students regardless of the social setting in which the school operates.
4. The school staff should be held accountable for making changes in the educational system, not only on the basis of informed opinion, but also on the basis of information collected for the purpose of identifying effective components of the educational process.

Insert Figure 1 about here

Within the framework established by these premises, a functioning accountability system, like the one illustrated in Figure 1, can be built. This system is essentially an information system for making decisions about what actions should be taken to change the educational process for the purpose of improving student achievement. The system consists of three phases: (a) the assessment of student performance, (b) diagnosis (the identification of factors related to this student performance), and (c) corrective action (including design, implementation, and evaluation).

The Establishment of Minimum Standards for Student Performance

The first step in designing an accountability program in a school system is to identify the performance objectives for student achievement; that is, to identify levels of performance that are considered acceptable for each age level. As used in this article, minimum performance standards refer to the lowest level of acceptable student performance within a criterion area

of knowledge, subject matter, or educational skill for all of the students in the educational system at a given age level attending regular classes. Students who are attending special classes, such as bilingual or special education classes, would be excluded. Minimum performance standards could, of course, be established for these special groups.

The accountability plan requires that there be one set of minimum performance standards for all of the regularly taught students in the educational system. Minimum acceptable performance should not mean one thing for students in one school and another thing for students in a different school. Individual schools within the school system can expand on this core of common minimum performance standards to fit their own situation as long as all of the schools within the educational system agree to the common set of minimum performance standards. Whenever a significant percentage of students in a school or within the school system fail to achieve minimum performance standards in a criterion area, corrective action should be taken by the staffs in that school or school system.[2]

Ideally, these minimum performance standards would be made public by the local school board, based on the recommendation of the school superintendent and as the result of a working document developed by representatives of the parents, professional staff, school board, and citizens. Public disclosure is an important feature of an accountability system.

The establishment of minimum performance standards would ultimately be the responsibility of the local board of education and the superintendent. For the purposes of establishing reasonable standards it might also prove useful if a Task Force could be formed to advise the local board and the superintendent on the establishment of these standards. This Task Force

should most likely be composed of representatives of the school board, the central administration, the teachers, the administrators, the parents, and the concerned citizens in the community. It would also be helpful if curriculum experts and measurement specialists could be included on this Task Force from the beginning so that their input could help to shape the resultant recommendations concerning these minimum standards.

The process by which this Task Force would function would be critical to its success. The most practical way to initiate the function of the Task Force would be to limit its initial recommendations to a few grade levels and subject areas (e.g., reading and mathematics) so that it does not start out with the grand hope of trying to establish minimum standards for all of the subjects across all of the grade levels in the school district. It might also prove useful to form subcommittees within the Task Force to allow working subcommittees to meet at times different from the regular meetings of the entire Task Force.

Undoubtedly the most promising place for the Task Force to begin its work would be by the study of the individual test items on whatever standardized achievement tests are currently being used within the school district. This study might very well lead to the recommendation of specific cutoff scores within subtests or across the tests based on the items within the tests that seem to measure the instructional objectives which are considered important to the goals of the school district. Technical procedures for deriving cutoff scores have been suggested by Nedelsky (1954). To the extent that these recommendations become a matter of discussion in public meetings and eventually become public policy within the school district, the entire community,

including the professional staff of the schools, can work together toward common objectives.

The Student Development Index

An essential element in a functioning accountability plan is a data analysis procedure that allows the staff of each school to compare student performance in their school with that of all other schools in the educational system at each age level and in each criterion area. There are many ways in which this comparison can be made. One way is the annual reporting of the average reading scores of all of the schools in a city at selected grade levels. The major difficulty with such a procedure is that the scores ignore completely where the students were in their educational development to begin with. The school staffs should be held accountable not simply for where their students are at the end of the school year, but also for how much the students have improved during a particular period of time. The important emphasis should be on the amount of <u>improvement</u> in student performance.

The work of Hilton and Patrick (1970) and Dyer, Linn, and Patton (1969), as well as the work of other researchers, makes a strong case that a measure of the longitudinal development of the same students would be appropriate if such a measure could be found. The most desirable procedure appears to be one which takes into account both the initial and current achievement of the <u>same</u> students in each school so that a truly functional measure of student development across schools can be generated.

The purpose of an index of student development is to identify schools most urgently in need of corrective action and to facilitate the development

of intelligent and coordinated plans for corrective action. Once the indices are produced, the relationship between these indices and the educational process variables can be studied as a first step toward developing intelligent plans for corrective action for each school.

Such an index of student development should not be considered as an alternative to minimum performance standards. Minimum performance standards are an essential element within an accountability plan because they help to identify those students and those schools which most urgently require corrective action. Minimum performance standards, therefore, represent absolute standards of performance for all students in the system at a given age level and provide an answer to the question: "How well is each student performing now in a given criterion area?"

The index of student development, on the other hand, is a relative standard that allows the performance of the students in a school to be compared to the performance of the students in any other school in the school system. It provides an answer to the question: "How much has the performance of the students in this school changed over a given period of time relative to the performance of the students in other schools?" It therefore allows the school staff, in certain instances, to understand that, while the overall performance of many of their students is still not up to minimum standards, they nevertheless have improved substantially from their earlier performance. Similarly, it may be used to single out those schools which, even though they do not have a significant number of their students performing below minimum standards, perform poorer than other schools.

The Meaning of the Student Development Index

The student development index is a number that describes how much the students in a certain grade of a particular school have developed in a given criterion area over a period of time. A Student Development Index is a longitudinal measure of student development which is intended to summarize the development of students who are in the same school for a given period of time; preferably, this would take place over two or more years to allow the school a reasonable period of time during which to influence each student who is included in its average score. The Student Development Index should be computed for a given school using only the scores of the students who were attending that school for the time period under study and who participated in both the initial and current testing programs. Although those students who have transferred into the school during the time period between the initial and current testing would not be included in the computation of that school's Student Development Index, they could be included in the description of the school that lists the proportion of students who are performing below minimum standards in a given criterion area during the current testing program.

Note that student stability is of primary concern in computing a Student Development Index, not student mobility. The typical measure of student mobility, the ratio of transfers in or out to the total enrollment, does not give an accurate picture of student stability, since in some schools the students who transfer in often also transfer out. This phenomenon can produce a mobility factor greater than 100 percent even though a substantial number of students have remained in the school during the two testing periods. Whether the two-year period for computing the Student Development Index allows

a sufficient number of schools to be represented in the computation of the Student Development Index needs to be carefully studied in each school system. In some cases, the period of time over which the Student Development Index is computed may need to be shortened to one year.

The purpose of the Student Development Indices is to establish preliminary indicators of student development for each school in the educational system across certain grade levels. The Student Development Indices can then be used to identify educational process variables which appear to be likely candidates for corrective action strategies. Schools with higher Student Development Indices can be used as models for what the schools can accomplish, while schools with lower Student Development Indices can be singled out for intensive corrective action.

The Computation of the Student Development Index

The Student Development Index is a deviation from a regression line. The method proposed for computing the Student Development Index is the regression of individual student output on individual student input; this is one of the four methods studied by Dyer, Linn, and Patton (1969). The regression line is defined by the performance of all students in the educational system at an initial point in time and at the most recent testing. The Student Development Index for a school is the positive or negative deviation of that school's current mean score from that point on the regression line corresponding to its initial mean score.

An example of the computation of a Student Development Index might help to clarify its meaning. Suppose that a school system was interested in studying the development of its students from the end of third grade until the end of

fifth grade in the area of reading. For those students who were in the school system for both the third grade testing and the fifth grade testing, the first step would be to compute the equation for the regression line formed by regressing fifth grade reading scores on third grade reading scores. The regression line produced might look like the one given in Figure 2. The numbers along the axes in the figure are arbitrary and used for illustrative purposes only.

Insert Figure 2 about here

If only the third grade reading score for a group of students were known, the best estimate[3] of their fifth grade reading score, on the average, would result from substituting their third grade reading score into the regression equation. For illustrative purposes, the hypothetical performance of two schools is also included in Figure 2. School A had an average third grade reading score of 15 and an average fifth grade reading score of 30 for the same students, while School B had an average third grade reading score of 32 and an average fifth grade reading score of 53 for the same students. Since the point representing School B's performance falls above the regression line, School B would have a positive Student Development Index. Since the point representing School A's performance falls below the regression line, School A would have a negative Student Development Index.

The formal steps for computing a Student Development Index at a given grade level for each school in the system are as follows:

1. Identify the students in the school system who have both initial and current test scores in a selected criterion area.

2. For these students, compute the regression of current individual student scores on initial individual student scores.[4] This regression equation is of the form:

$$\hat{Y} = a + b_1X_1 + b_2X_2 + \ldots + b_pX_p$$

where a = a constant number defined by the Y-intercept,

b_i = the regression coefficient for predictor i ,

X_i = the initial test score for a student on predictor i , and

$\hat{Y}$ = the estimated current test score for each student

3. For each school, compute the estimated average current score, $\hat{Y}_i$, by substituting the school's mean initial score for those students who were enrolled in that school for both the initial and current testing periods into the system-wide regression equation computed in Step 2.

4. Let $\overline{Y}_i$ be the actual mean current score for each school. The Student Development Index (SDI) for a school is:

$$SDI_i = \overline{Y}_i - \hat{Y}_i$$

Once the Student Development Index is computed, it is a simple matter to transform it into a standard score or percentile rank.

If we were to apply these steps to Figure 2, we would discover that School B has a Student Development Index of approximately +6 while School A has a Student Development Index of approximately -7.

O'Connor (1972) claimed that this method for computing student development indices is biased. However, his argument is based on the assumption that the Student Development Indices should <u>not</u> be correlated with mean inputs. But

schools from wealthier districts often serve higher-achieving students and generally have more experienced, better trained teachers and better physical resources than schools from less wealthy districts. If these conditions are associated with more effective schools, then one would expect a positive correlation between mean student inputs and the Student Development Indices. Whether or not the quality of the student body, as measured by mean achievement, is related to school effectiveness is an empirical question and needs to be studied. It should not be assumed that they are uncorrelated.

Further Clarification of the Student Development Index

By now the earlier statement that the Student Development Index is not a substitute for minimum performance standards should be a little clearer. Two schools could have identical, positive Student Development Indices and yet have quite different proportions of their students performing below minimum standards, since minimum performance standards apply only to current scores and ignore initial scores. Similarly, two schools could have negative Student Development Indices but differ dramatically in the proportion of their students performing below minimum standards. One of the properties of the Student Development Index is that it allows the performance of the students in any school in the system to be compared to the performance of students in other schools while taking into account not only where the students are in their current testing but also where they were in their initial testing. Thus, the Student Development Indices provide a way of comparing the performance of a group of students in a school with the performance of students in any other group in the school system. This group could be all of the students in the school system or it could be composed of students with similar levels of

initial performance. The Student Development Index and the minimum performance standards are, therefore, complementary in the type of information that they provide.

A Student Development Index for a school represents the total influence of the school, the home, and the community on the educational development of the students in that school. A Student Development Index is not an accountability index; that is, it is not a measure of the degree to which the school staff has been accountable for their performance. Important aspects of an accountability program, such as participating in the goal-setting process, in the establishment of student performance objectives, in the diagnostic analyses, and in the implementation of corrective action strategies do not enter into the computation of the Student Development Index. We have tried to stress throughout this article that each school staff should be held accountable, not for what its student development indices are, but for what they do about them. This is an essential principle within an accountability system. The development, implementation, and monitoring of a corrective action plan are the most important aspects of an accountability system.

A Student Development Index has two important functions within an accountability program: (1) It supplements the information provided by student performance in terms of minimum performance standards by allowing the development of the students in each school to be compared to the development of students in other schools in a given criterion area at a certain grade level. (2) It provides a measure of student development that can be related to educational process variables so that intelligent hypotheses about useful change strategies can be incorporated into plans for corrective action within the school system.

Other Ways of Defining Student Development Indices

The Student Development Index as defined here is the deviation of the average performance of students in a school from the performance of students in the school system who are like those in the school on initial achievement. The students in the school system constitute a reference group for the school in the sense that the performance of students in the school is compared with the performance of all students like them in the school system.

There are other ways in which the Student Development Index might be defined. One way is simply to change the reference group. For example, one could use students in schools judged to be fostering student development at an acceptable level as a reference group instead of using all students in the school system. In this sense a different reference group would redefine the Student Development Index.

There are other methods of defining the Student Development Index that depend upon longitudinal data. One of these is the school residual method proposed by Dyer (1970). A School Residual is the difference between the mean output score for a school and the mean output score estimated from the regression of school mean output scores on school mean input scores.

Another way that has been used to define a Student Development Index when longitudinal data are available is by means of the mean difference score for a school; or, where data are available on a reference group, the mean difference score for a school minus the mean difference score for the reference group.

The definition of the Student Development Index does not even have to depend upon longitudinal data, although the Dyer, Linn, and Patton (1969) and the Hilton and Patrick (1970) studies indicate the desirability of

longitudinal data. For example, the Student Development Index could be defined in terms of cross-sectional comparisons or comparisons with a national norm group.

These other ways of defining a Student Development Index were considered but rejected in favor of the definition used in this article. Which definition is "best" in terms of validity and stability over time is still an open question. Marco (1973) compared several school effectiveness measures based on longitudinal data. Other studies showing how different kinds of Student Development Indices behave, particularly over time, are needed before a "best" definition can be formulated with confidence.

Forsyth (1973) recently studied the stability of the growth indices (which he termed performance indicators) at the secondary school level from year-to-year using Iowa statewide testing program data from the Iowa Tests of Educational Development (ITED). This study utilized a random selection of 50 of 320 schools for which matched-longitudinal data were available for ninth and twelfth grade students in two time periods: 1965-68 and 1966-69. The School Residual Model (Dyer, 1970) was utilized. School means were used as the input and output scores instead of individual student scores. The correlation between the residual scores for these two independent groups of students ranged from .11 (Vocabulary; Quantitative) to .50 (Social Studies) with a median correlation of .28 for the 10 output scores which were predicted. The correlation between the residuals for the Composite ITED scores for the two groups was .32. This study implies that the growth indices produced by the School Residual Model are not very stable, and therefore might not be appropriate for isolating school effects. A similar study needs to be done for the method of computing a Student Development Index proposed in this article.

The Base-Year Student Development Index

An important extension of the concept of the Student Development Index is the use of the base-year Student Development Index. If the Student Development Indices are computed each year based on that year's student performance in the school system, there would be no way for each school to know if it had improved in its performance over the previous year. There would also be the problem that those schools with the lowest Student Development Indices each year would have to make tremendous improvements in order to achieve positive Student Development Indices the subsequent year, assuming that the school system as a whole would improve.

One way to permit each school to answer the question "Has our performance this year improved since last year?" would be to define the first system-wide regression equation for a given criterion area at a grade level as the base-year equation. Using this base-year equation, each school could plot its performance over a several-year period by substituting its mean current score into the base-year equation in order to obtain a Student Development Index relative to the base year.

Each school could then receive two different types of Student Development Indices each year in each criterion area at each grade level: (1) a Student Development Index based on its current year's performance compared to all other schools in the system, (2) a Student Development Index relative to the base-year regression equation. Once a regression equation had been used as a base-year equation for several years, say five years, a new base-year equation could be computed to serve as the base-year equation for a second five-year period. If each school plotted its Student Development Indices relative to the base year along the Y-axis for each year along the X-axis,

it could obtain an easily interpretable picture of its performance profile over a several-year period in each criterion area at each grade level.

Process Variables

Once the Student Development Indices are computed, the next step in the accountability plan is to relate the characteristics of the school staff, programs, facilities, students, and policies to these Student Development Indices. This information will be used to select those characteristics of the educational system which are likely to be important in developing plans for corrective action. The characteristics that are to be selected for corrective action should be those that are at least moderately related to the differences in Student Development Indices among the schools. We have called these characteristics of the educational system process variables.

A process variable as defined here includes what Dyer (1970) called "easy-to-change surrounding conditions" and "educational process." Educational process, according to Dyer, refers to activities designed to improve pupil performance, such as lessons, counseling, and recreational activities. Surrounding conditions represent those conditions within which the school staff must operate; for example, level of family income, school physical facilities, and degree of industrialization of the community. Dyer divided surrounding conditions into easy-to-change conditions and hard-to-change conditions. Easy-to-change surrounding conditions are those that can readily be altered by the school or some other educational agency. As used in this paper, process variables refer to those easy-to-change surrounding conditions and educational process variables that are (a) thought to influence student development and (b) can be changed by school personnel or representatives of

the school system. Thus, process variables include some of Dyer's easy-to-change surrounding conditions and all of his educational process variables.

A process variable, therefore, is any characteristic of the educational system which is hypothesized to affect student development and over which the school staff members or representatives of the school system can exercise some reasonable degree of control. This latter requirement is an important part of the concept of a process variable. It would make very little sense to hold someone in the educational system responsible for something over which he can exercise little control.

Suppose, for example, that a school system has decided that it would like to hire more experienced reading teachers because that characteristic was consistently and substantially related to the reading Student Development Indices. It would make no sense to hold the local school board accountable for not hiring more experienced teachers if a school bond issue necessary to raise the necessary monies for this purpose had been defeated by the taxpayers. Similarly, it would make no sense to blame the teachers for not increasing per pupil expenditures in reading, since teachers typically have very little control over this characteristic of the educational system. Each responsible person in the school system--teacher, administrator, supervisor, curriculum specialist, school board member, superintendent--should be held accountable for those characteristics which he or she can directly influence to some reasonable degree.

Process variables can be grouped into five major categories: (1) student-body characteristics, (2) staff characteristics, (3) other school characteristics, (4) school district characteristics, and (5) home and community characteristics. Some examples of process variables are presented

in Table 1. The examples given in Table 1 include characteristics which might be related to student development and, further, which are potentially changeable in some meaningful way by the school staff or representatives of the school system. The examples are not intended to provide an exhaustive list of process variables, since it would be possible to generate a list of several hundred process variables without much difficulty.

Insert Table 1 about here

The most efficient way to collect information about these process variables would be to collect them at the lowest level within the school system and aggregate the characteristics to the larger levels within the hierarchy. For example, information about the training and experience of teachers could be collected at the level of the individual teacher and aggregated to the grade, school, and district levels.

Student-body characteristics are useful as process variables for describing groups of students rather than any individual student. Some student-body characteristics can function as input variables, as process variables, or as criterion variables. Student attitude toward school, for example, could be used either as a process variable or as a criterion variable worthy of attention by itself if the school system had as one of its goals the fostering of a positive attitude of the students toward school.

Staff characteristics are those personal and professional characteristics of teachers, administrators, supervisors, aides, counselors, and special service staff that are hypothesized to be related to student development. Since the Student Development Index is computed at the grade level within the

school rather than at the classroom level, it is not necessary to retain the identity of any individual teacher in the accountability file used to relate staff characteristics to student development.

Other school characteristics is the category reserved for characteristics of the programs, facilities, materials, and policies of the educational system. Whenever students in different schools differ more from each other in their educational development than they do from students within the same school, it is reasonable to expect school characteristics, including the quality of the curriculum, the quality and types of instructional methods, the school atmosphere with regard to learning, and the like, to be related to these differences among schools. It is important to remember that the accountability plan is intended to focus on that part of student development that is concerned with the differences among schools, not the differences within schools.

School district characteristics refer to the aggregated characteristics of students, staff, and schools across schools and to those characteristics that make sense only at the district level. For example, the experience and training of the superintendent, the central office staff, and the school board make sense only at the district level since these characteristics are assumed to be applied equally to all of the schools.

Within the context of this accountability plan, home and community characteristics are those aspects of the educational setting outside of the formal school program and which the school staffs or representatives of the school system can influence to some reasonable degree. This posture toward home and community variables is an important aspect of the accountability plan. While certain types of research studies might be interested in studying the relative influence of home, community, and school factors on student

development, such an approach is quite different from that which we envision for an accountability program.

A basic principle of the accountability plan that we are proposing is that the school staffs and the representatives of the school system should be held accountable for the performance of their students regardless of the setting in which the school operates. This means that factors such as the background of the students, the socioeconomic status of the parents, the unemployment rate in the community, and the like cannot be used to rationalize the performance of the schools. The best way to guarantee that this problem will not be a serious one is to decide in advance of the data analyses which variables can be influenced to a reasonable degree by the school staffs or the representatives of the school system.

There is no question that home and community factors do influence student performance. Variables such as parental education or income, size of the family, the unemployment rate in the community, and the physical condition of the home are undoubtedly related to student development. We strongly recommend, however, that variables such as these not be used either to compute any of the Student Development Indices or as process variables to be correlated with the Student Development Indices, since the school staffs and the representatives of the school system cannot reasonably be expected to produce substantive changes in these conditions.

The definition of the Student Development Index required that only prior performance was in any way controlled in computing the Student Development Index. Socioeconomic status and other variables over which the school has no control are not used as predictors in computing the Student Development Index. Dyer (1970) has

argued that both student input and hard-to-change surrounding conditions should be used as predictors in computing Student Development Indices. Some proponents have asserted that since the school cannot be expected to change these variables, their influence should not be reflected in a Student Development Index. While this line of reasoning can be persuasive, there is a valid reason for not controlling for these variables. Controlling a variable such as SES forces students from a given background to be compared only with students from the same background. Such comparisons may lead one to conclude that a school is doing a relatively good job in dealing with such students. However, the performance in the school might be low compared with students who are from different backgrounds but who have the same initial performance levels. It seems desirable from an accountability point of view to identify these schools and to require them to take corrective action in an attempt to break the ties that seem to bind poor background with poor achievement.

The school staffs and the representatives of the school system can, however, influence some home and community factors. If the health of the students is being seriously impaired because of a lack of nutritious food, the schools can offer a free breakfast program. Similarly, if the students cannot find a quiet place to study outside of school hours because of crowded conditions in the home, the school staff might decide to organize a parent volunteer program to manage a study center after school hours and on Saturdays. If the parents do not provide adequate support to school activities, the school staff might decide to undertake a systematic procedure to improve the level of parental participation and support.

The basic principle in guiding the selection of process variables to be included in plans for corrective action is that the selected variables can be included in a plan for corrective action designed to produce substantive changes in student development.

Diagnosing Student Performance

Once the Student Development Indices have been generated and the process variables identified, the decision maker within the educational system is faced with deciding among many possibilities in planning changes in the functioning of the schools. Should teachers who have had special training be added to the staff? Should a special type of curriculum be instituted? What is the best way to involve members of the local community in the operation of the schools? The problem that every participant is faced with at every level of the educational system--teacher, administrator, supervisor, board member--is to select those process variables which, when emphasized within a coordinated plan of corrective action, will be likely to produce desirable changes in student development. This selection process becomes especially important when it is considered within the enormous constraints of the available budget for staff, materials, and facilities.

The exercise of professional judgment is necessary and proper within such an accountability system. It is likely to be most effective, however, when it is done within the context of a useful information-processing system. The better the information that is available, the more responsible and valid can this professional judgment become.

It is necessary to study the relationships between the process variables and the student development indices in order to create sensible hypotheses for planning corrective action. The key questions to be answered by such a procedure are: "Which process variables are most likely to influence positively student development in each particular situation? What are the characteristics that discriminate between schools with high and low Student Development Indices?"

This systematic study of the process variables can proceed in two directions: (1) a study of the correlations between the process variables or a reduced set of process variables and the Student Development Indices, and (2) the comparison of high and low performing schools using systematic case study methods. Correlations may not necessarily point the way toward truly causal factors, but they provide a good starting point in the search for likely causal process variables.

The use of formal case study methods becomes especially important in the search for important process variables that either are not being measured adequately within the information system or which need to be added to the information system. For example, measures of "teacher morale" in terms of the teachers' perception of the rules and regulations of the school, their participation in voluntary teacher-student activities, and their perception of student interest and motivation may be discovered through case studies as an important dimension to be added to the information system. Or it might be discovered that the attitude of the teachers toward learning may not be measured adequately by the current paper-and-pencil test that is being used in the school system.

If a large number of process variables are measured, it is usually desirable to reduce the number of such variables into a smaller, more manageable set. The first step in reducing the process variables is to form logical groupings of the variables into major and minor categories. We are suggesting that five major categories be used: (1) student-body characteristics, (2) staff characteristics, (3) other school characteristics (such as program, policy, and facilities), (4) school district characteristics, and (5) home and community characteristics. Other major categories could be added or substituted for these as necessary for the particular information system. The next step would be to form logical subgroupings of variables into minor categories. For example, one of the minor categories within staff characteristics might be "teacher preparation" which could include such characteristics as the number of college credits in reading instruction, the number of in-service hours devoted to development in the teaching of reading, and so forth.

Methods for checking on the appropriateness of the logical groupings and for refining and adjusting the combinations of variables are available. Such methods involve the use of component and factor analyses. By applying these techniques to the data in the Equality of Educational Opportunity Study it was possible to reduce some 400 variables to 30 or so more general variables (Mayeske et al., undated).

The indices produced by such a technique can then be correlated with the Student Development Indices in an attempt to select variables likely to result in improvement in student development when emphasized within a corrective action plan. It is not obvious what indices should be used to measure the

importance of the various process variables. The Mayeske study used as an index the percent of variance accounted for by a variable, including its unique contribution and its joint contribution with other variables. Raw regression coefficients or path coefficients could also be used, as could zero-order correlations. The choice of technique would make no difference if correlations did not exist among the process variables. The existence of multicollinearity in the data makes the choice difficult. Work on the problem of choosing an appropriate measure of importance when independent variables are highly correlated is still going on (see, for example, Darlington & Rom, 1972).

The problem of selecting process variables to be included in the plan for corrective action is further complicated by the fact that while some process variables are apparently related to student development across the schools in the educational system, they may not be practically useful in the plan for corrective action for a particular school. For example, if amount of teaching experience seemed to be moderately correlated with the Student Development Indices in the school system, it might not be a characteristic that is practically susceptible to change in a particular school. If there is a turnover of only a few teachers every year in a school, it might take several years before enough more experienced teachers could be hired to replace the teachers who leave the school even if the ones who leave the school are the less experienced teachers. Further, the staff budget for any particular school or school district may not permit a widespread hiring of more experienced teachers since these teachers are more expensive to employ. An alternate plan would be to provide intensive in-service training for the currently employed teachers.

The use of systematic case studies by trained observers and interviewers might lead to the discovery of process variables that seem to produce observable differences between schools with high and low Student Development Indices. Such procedures may help to discover why schools with very similar profiles on the process variables have very different Student Development Indices. The purpose of the case studies is to obtain information that can be used to improve the instructional program, not to evaluate the staff at the respective schools. Teachers, administrators, parents, citizens and others could be trained to collect information through these case studies and could visit selected schools for several days at a time. Such case studies require careful designing and planning, careful training of the observers and interviewers, and intensive pilot testing of all of the procedures. The task of these case studies is to describe the characteristics of the school as completely as possible, to identify potentially important process variables, and to suggest ways of measuring these process variables.

Designing Corrective Action

The procedures described thus far in this article have dealt with information about the educational development of students. The collection, analysis, and interpretation of information are necessary but insufficient components of an accountability plan. The key component of an accountability system is what is done with this information to design a comprehensive plan for corrective action, and later to implement, monitor, and evaluate it.

In a particular school, either the occurrence of low Student Development Indices or the discovery of a large percentage of students performing below minimum standards signals a serious deficiency in student development. Either

of these situations will cause concern among parents, professional staff members, board members, and interested citizens.

An intelligent plan for corrective action requires that the professional staff and the representatives of the school system carry out complex and coordinated activities. There are no simple solutions to the remedy of serious deficiencies in student development. Firing some teachers or removing some administrators may be a simpler strategy than designing an intelligent plan for corrective action, but such simplistic attempts to solve deficiencies in student performance are not likely to be successful in the long run. The problem-solving process in a particular school within an accountability system is carried out by identifying the potential causes of educational deficiencies, proposing potential solutions, devising means for effective changes in the functioning of the school program, and requiring that the resulting strategies be implemented and monitored on a regular basis.

To achieve effective corrective action, each member of the school system must accept responsibility for the implementation of those aspects of the corrective action plan for which he is responsible. The staff of each school and each central administration should devise a detailed plan listing the responsibilities of staff members which capitalizes on their special knowledge of the local situation. This plan for corrective action should define who will be responsible to whom and for what actions, and should include a time schedule and a budget that will be required for the successful implementation of the plan.

Guidelines for Corrective Action

The Board of Education and the Superintendent of the school system should be responsible for preparing a document listing guidelines for corrective action

based on the results of the accountability analyses. These guidelines provide a means for coordinating the corrective action plans across the schools in the educational system. These guidelines would summarize the results of the accountability studies and set priorities for decision-making within the accountability system.

An important aspect of these guidelines would be a checklist for the design of corrective action plans. This checklist would assist the school staffs and administrative staffs to prepare a plan for corrective action. A sample checklist is presented in Table 2.

Insert Table 2 about here

The guidelines for corrective action would also present profiles of selected schools on important process variables. These profiles should compare not only schools with very different Student Development Indices, but also schools with similar Student Development Indices and very different scores on these important variables so that the school staffs do not oversimplify their plans for corrective action.

School Plans

Each staff member of each school should accept the responsibility for planning his own professional activities within the school. A coordinated plan for corrective action for each school would be the responsibility of the school principal who, with selected staff members, would summarize and organize the individual plans for corrective action into a school plan. A coordinated plan for corrective action across the schools would be prepared

under the direction of the district superintendent. This coordinated plan at the school district level would undoubtedly require some negotiation with the various school principals.[5]

Staff performance objectives have meaning only in the context of a school or district plan. The plan for each school and district should list the expected performances of each staff member. Each staff member should be in agreement with these expected performances. If the implementation of a corrective action plan is to be successful, it should occur within a supportive atmosphere. An information system that includes a public commitment to implement a specific plan and the regular reporting of progress toward the implementation of the plan can be a useful aspect of communication within a school system. To the extent that the atmosphere is punitive and threatening, evasion and obstruction will be the likely consequences. An accountability system requires mutual cooperation and support by the interested parties.

A plan for corrective action <u>within each school</u> should concentrate first on applying available resources to those students performing below minimum standards. Obviously, this does not mean that those students who are performing above minimum standards should be neglected. Since minimum standards and Student Development Indices are applied to each criterion area at each grade level, it is quite possible for students to vary in their performance within their own school in different grades and in different criterion areas. Maximum attention within each school, therefore, should be given to those grades and criterion areas in which the student performance is most deficient.

<u>Across schools</u>, the plan for corrective action should give first priority to those schools in the educational system which have large percentages of

students performing below minimum standards and second priority to those schools which have low Student Development Indices.

Every school can improve its performance. Those schools which have neither low Student Development Indices nor a substantial proportion of their students performing below minimum standards should focus on either trying to improve their performance even more in those criterion areas, or should extend their plan to include criterion areas for which Student Development Indices are not generated. Whenever plans for corrective action are not urgent, plans for improvement become important.

All aspects of the school--the performance of the various staff, the programs, the materials, the facilities, the organizational arrangements--should be considered in developing a plan for corrective action. The entire staff of each school should contribute to the development of the school plan under the leadership of the school principal. The plan should summarize the individual plans of the school staff and should describe who will be accountable to whom for what actions.

District Plans

Once the school plan has been prepared, it should be submitted to the district superintendent. The plan should include a brief rationale for the changes that are needed, a specification of these changes, the assignment of responsibilities for these changes, a schedule for implementing the proposed changes, and a method for monitoring the implementation of the plan. The superintendent and the central administrative staff may decide to suggest changes to the school staffs or to require additional justifications or description of a school staff's plan. The superintendent and the

central administrative staff would then be responsible for preparing a coordinated district plan which would summarize the plans of the school staffs and would specify the actions required by the central administration.

The local school board would then be responsible for adopting a district-wide plan as a result of a working series of discussions with the district superintendent and the central administrative staff. This district-wide plan might cause the plans of the staffs at some of the schools to be modified so that a coordinated plan for all the schools can be produced.

Adopting a plan implies a commitment to implement the plan and to supply the necessary resources for the carrying out of the plan. Once the resources are allocated, those responsible for the implementation of the plan should be held accountable for using these resources in the manner specified in the plan. The district-wide plan, which presumably would become a matter of public record, should also include a time schedule for the components and a procedure for monitoring its implementation.

Monitoring the Corrective Action Plans

The corrective action plans for each school and for each district should include lists of specific performances for members of the various school and district staffs. Such performances might include the administration of special diagnostic tests to those students scoring below minimum standards, the organization of special tutorial classes for students with particular deficiencies, and the scheduling of special meetings with parents of particular students who are performing below minimum standards. A schedule for the production of learning aids or for in-service training sessions for particular teachers may become essential parts of a corrective action plan. In all cases,

specific and definite tasks should be included with the names of staff members responsible for carrying out these tasks and the dates by which these tasks are to be completed.

The monitoring of the corrective action plans will include the submission to the district level of progress reports which should indicate whether or not the responsible persons are carrying out their specific tasks in accordance with the time schedule projected. If activities projected in the corrective action plans are not being carried out, then those persons responsible for the particular tasks are accountable for explaining why specified tasks are not being accomplished. This information should be included in the progress reports and should be communicated to the public. It may be that additional resources are needed for carrying out the plans properly. Or, it may be that overly ambitious plans need to be adjusted in the light of actual experience. In either case, appropriate information to support a plan of action or an adjustment must be made available.

Evaluating the Corrective-Action Plans

The ultimate value of any corrective action plan will depend on the extent to which student performance is enhanced. The evaluation of corrective action plans will not be a simple process. The monitoring process will provide an indication of how well a plan has been carried out. Student progress will be indicated by the Student Development Indices of the schools. If particularly effective corrective action plans are identified, then these plans should be tried out in similar schools to see if their effectiveness is independent of the particular school in which the plan was implemented.

No two schools will be exactly the same, and thus plans will be constantly modified. No simple, single, master plan will provide a panacea for the myriad problems of a school system. But, valuable information can be collected and stored as the necessary first steps in the development of a reasonable decision-making process which will hopefully lead to the improvement of the entire school system.

The Planning and Operations Committees

Each school and each district should have a Planning and Operations committee which would serve in an advisory capacity and which would make recommendations about the corrective action or improvement plans to the school principal and district superintendent, respectively. The composition of the groups represented by these committees would be expected to vary from school to school and from district to district, depending on the local circumstances. The school principal would be responsible for appointing the school's Planning and Operations committee, while the district superintendent would be responsible for appointing the district's Planning and Operations committee.

The Planning and Operations committees should function as working committees with advisory status only. They should not have the power to direct or mandate the activities of the school principal or the district superintendent. They should provide a mechanism for assisting the principal and the superintendent in developing a corrective action plan. It is essential that these committees work harmoniously so that they can provide a constructive source of suggestions to the principal and superintendent. An example of the composition of these committees is presented in Table 3.

Insert Table 3 about here

In addition to the Planning and Operations committees for the schools and the school district, we suggest the formation of a district-wide accountability advisory committee. This accountability committee would be expected to advise the district superintendent and the local school board regarding matters of policy in the accountability plan, to assist in the development of system-wide minimum performance standards, and to provide suggestions for the guidelines for designing corrective action plans. This accountability advisory committee should not in any way infringe upon the powers and responsibilities of the local school board or the district superintendent and should limit its functions to making recommendations to the local school board and the superintendent.

Planning Cycle

The cycle for a school and district plan would most likely include the following components: (a) a spring testing in the designated criterion areas, (b) the preliminary analysis of the accountability data by the following fall, the development of a tentative plan and the implementation of whatever aspects of the plan can be implemented during the fall, (c) the coordination of the school plans at the district level by the following January or February, (d) the approval by the local school board in the spring of a district-wide plan, and (e) the full implementation of the plan by the following October. Each year this cycle would be repeated based on the current performance of the students in the system.

Implementing Accountability

If a school system tried to implement a comprehensive accountability system like the one described in this article, the implementation would be most likely

to succeed if it took place in gradual, planned stages. These stages are outlined here. These plans would operate concurrently, but there does exist an important distinction in their function and purpose.

The Short-Range Plan for Accountability

The short-range plan for accountability includes a field test of the information system, the development and use of training materials in the communication of the accountability plan to the interested parties within the school system, and the preparation of prototype reports of case studies of selected schools.

The field test for the short-range plan would be based upon student performance data that are already available in the school system. In addition, it can be used to test the feasibility of data collection procedures within an expanded information system; to test the various statistical models that could be applied to the data; to provide more precise estimates of the cost of establishing and maintaining an accountability system; to provide preliminary data regarding the relationship between process variables and the Student Development Indices; and to test the data reduction procedures.

Whether a sample of schools within the school system should be chosen for the field test, or all of the schools in the system should be included in the field test, depends largely on the number of schools in the system. Regardless of the number of schools selected for the field test, however, the data should be treated according to the following principle: For the purpose of the field test, each school's performance should be treated as confidential information and should be revealed to no one outside of one or two members of the research staff. This principle is essential to the successful implementation of the accountability plan.

Once the schools have been selected, the next step is to focus on student performance in specific grade levels and criterion areas. The individual student record file that is maintained for each student in each school is the most likely source of information about student performance in most school systems. The data in these files could also be used to help answer several critical questions within the accountability plan: Are there ways to approximate the computation of the Student Development Indices at less cost? Which process variables seem to be related to the Student Development Indices? What are the advantages and disadvantages of various methods of relating process variables to student development?

Perhaps the most important aspect of the short-range plan is the use of the data from the field test to develop realistic training materials for the accountability program. The development, field testing, and subsequent implementation of these training materials may be the most critical component of the short-range plan. These materials would be used to communicate the purposes, use, and means of interpreting the data supplied within the accountability program. Professional staff members, parents, school board members, and interested citizens would be provided with the opportunity to learn about the functioning of the accountability program through these materials and about how the program can help them to improve the functioning of the schools in the system. Any attempt to implement an accountability program on a large scale that does not include an extensive use of such training materials is likely to result in a dismal failure. Such training materials are not a luxury, but rather an essential component within the implementation of an accountability program.

These training materials would include prototype reports of case studies of selected, anonymous schools. Information about these schools could be used in conjunction with the information about the relationship between the process variables and the Student Development Indices in order to have the participants in the training program practice preparing a plan for corrective action for these selected schools. The participants would be asked to prepare a plan for each school as if the data applied to their own school. The prototype reports would have the advantage of supplying data about actual, but anonymous, schools in the system and could be written to span a wide range of situations and problems within the system.

The Long-Range Plan for Accountability

The short-range plan for accountability would operate concurrently with the long-range plan for accountability. The long-range plan would include the establishment of minimum performance standards; the preparation of central data files that can be used to study student performance in a longitudinal manner; the expansion of the data system related both to process variables and criterion variables; and the development, implementation, and evaluation of school corrective action and improvement plans. During the long-range plan, each school's performance in terms of both the proportion of students scoring below minimum standards and the Student Development Index might very well be made a matter of public record. If the schools were not identified during the long-range plan, the accountability program would be unlikely to contain enough clout to inspire the intensity of corrective action strategies that will be required in some schools.

The preparation of data files is an important feature of the long-range plan. Their establishment will undoubtedly raise questions about the confidentiality of data. Since the accountability system applies to the performances of schools rather than individual students, it is not necessary to retain the identity of any individual student in the computer files used for the accountability analyses. A good way to protect the confidentiality of the information about individual students is to maintain two computer files in the accountability system. One file would contain the name, birthdate, sex and a unique file number for each student; a second file would contain that unique file number and the corresponding data on schools attended, attendance, test scores, and other information about each student. Only the latter file should be used in the accountability analyses. Ideally, these two files would be maintained separately under the supervision of two different members of the technical staff.

Similarly, two computer files should be created and maintained for information about staff members. One file would contain the staff member's name, birthdate, sex, and a unique number, while a second file would contain that unique number and information about that staff member's training, experience, and so forth. Once again, only the latter file should be used in the accountability analyses since it protects the confidentiality of information about each staff member. These two files would also be maintained by two different members of the technical staff.

The long-range plan would also include the establishment and maintenance of computer files containing information about each school's programs, policies, materials, facilities, standing on criterion variables (percent below standard;

Student Development Indices), and standing on the process variables. This file would be used primarily as the basis from which the accountability reports would be written.

Summary and Conclusions

A comprehensive plan for accountability has been described in this article. The plan describes an operational statement of the meaning of accountability. The primary purpose of the proposed accountability system is to promote student development. The system consists of assessment, diagnostic, and corrective action phases.

During the first phase an assessment is made of student performance on important criteria, such as reading achievement and mathematics achievement. Results could be expressed in terms of both the percentage of students scoring below minimum performance (as established by an acceptable procedure) and the Student Development Index.

The Student Development Index is a number that describes the average development in a given area of performance of students in a certain grade and school over a specified period of time. It is a longitudinal measure and is computed only on students who attended the school during the period of interest, preferably two or more years. Computationally, the Student Development Index is the deviation of actual school mean performance from estimated school mean performance. The estimated score is computed from the equation resulting from the regression of individual criterion scores on individual initial scores for all students in the school system. Substituting the mean initial scores for a school into the regression equation gives the appropriate estimated score for a school.

The Student Development Index is used: (1) to describe the performance of students in a school relative to students throughout the system, and (2) to provide a measure of student development that can be related to educational process variables.

Diagnosis, the second phase of the accountability system, begins where assessment ends. School process variables play an important role in this phase. A process variable is any characteristic of the educational system which is hypothesized to affect student development and over which the school staffs or representatives of the school system can exercise some reasonable degree of control. Process variables include student-body characteristics, staff characteristics, other school characteristics, school district characteristics, and home and community characteristics. A systematic study of process variables is initiated to identify those process variables that corrective action plans should focus on. The proportion of among-school variance accounted for by various combinations of process variables can be studied. In addition, case studies of high- and low-performing schools can be conducted.

Once assessment and diagnosis are completed, corrective action must be taken. The key component of the accountability system is what is done with the assessment and diagnostic information. School staffs are accountable for what they do to improve student performance. The corrective action phase begins with a document issued by the central administrative office on guidelines for corrective action. These guidelines should summarize the results of the assessment, identify important process variables, and present profiles of selected schools on important process variables. A checklist for designing corrective action plans should also be a part of this document.

Utilizing information from this document, staff members of each school, under the direction of the school principal, would organize individual plans of corrective action into a school plan. A coordinated plan for corrective action across schools is in turn prepared under the direction of the district superintendent. The plans should state as clearly as possible staff performance objectives, agreed upon by all parties involved. The objectives would specify the responsibilities of the various staff in implementing, monitoring, and evaluating the corrective action plans. The plans would focus first of all on those students performing below minimum standards; and secondly on those criterion areas in which average student performance (as measured by the Student Development Indices) was most deficient. Schools and districts performing satisfactorily with reference to the Student Development Indices or percent scoring below minimum standards would also be required to submit plans--improvement plans--for trying to improve their performance even more or for extending their activities to criterion areas for which assessment information was not generated.

For advisory purposes, each school and district would have a Planning and Operations committee, which would make recommendations about corrective action or improvement plans. An Accountability Advisory committee would also operate at the district level to advise the school board and superintendent on policy matters, to assist in the development of performance standards, and to provide suggestions for guidelines for designing corrective action plans.

Both short- and long-range plans for implementing an accountability system of this nature are necessary. The short-range plan includes a field test of the information system, the development and implementation of training materials, and the preparation of prototype reports based on case studies. A sample of

schools in the system could be selected for study if a large number of schools were in the system. The long-range plan would include the establishment of minimum performance standards, the preparation of central data files, the collection of additional information about process and criterion variables, and the initiation of corrective action.

The accountability system is based on the assumption that its implementation will lead to improved student development. Its ultimate value will depend on the extent to which student performance is actually improved.

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Footnotes

[1]A number of colleagues contributed to the development of the concepts discussed in this article. In particular, we would like to acknowledge the valuable suggestions of Henry S. Dyer.

[2]The reader should note that setting a minimally acceptable level of student performance does not mean that a student can be ignored as soon as he reaches that minimally acceptable level of performance. The professional staff of a school system should understand that these are minimum standards, not maximum standards. Obviously, each student should be encouraged to develop toward his maximum potential as a human being within the educational system.

[3]The word estimate is used strictly in the statistical sense of predicting a score based on a group of other scores, and it does not in any way refer to any type of arbitrary, subjective judgment.

[4]Other predictors besides the initial test score could be used to form a multiple regression equation. For example, grade five reading scores could be predicted by a weighted composite of grade three reading and mathematics scores instead of just the grade three reading scores. The use of a single predictor in the example is the simplest case.

[5]Perhaps a word of caution about the intelligent planning of resources would be appropriate. Obviously, one way for each participant in the educational system to avoid taking seriously his own responsibilities would be to blame the next successive level of responsibility for giving him insufficient resources to do an effective job. Thus, the teacher would blame the school principal, the school principal would blame the superintendent, the superintendent would blame

the local school board, the local school board would blame the mayor, the mayor would blame the governor, and the governor would blame the federal government. If the accountability system worked in this way, it would be dysfunctional. A creative use of resources requires the application of reasonably available resources at each level within the educational system or the entire process would degenerate into a fiasco.

Table 1

Some Examples of Process Variables

Student-body characteristics

- Attitude toward school
- Reading habits
- Study habits
- Interest in continuing education
- Self-concept and self-esteem
- Desire to learn
- Absence from school
- Achievement test scores

Staff characteristics

- Age
- Amount of teaching experience
- Amount of supervisory or administrative experience
- Amount and type of education
- Amount and type of in-service training
- Salary
- Grade levels taught
- Type of certification
- Absence from school
- Attitude toward students

Other school characteristics

- Teacher-pupil ratio
- Number and type of facilities
- Type of classroom arrangements
- Organization and scheduling operation
- Number of dropouts
- Availability and type of summer school program
- Availability of compensatory programs
- Expenditure per program
- Stability of enrollment

School district characteristics

- Training and experience of central administration
- Amount and type of education of central administration
- Expenditure per pupil and by program
- Stability of enrollment
- Salary of central administration
- Training and experience of members of board of education

Home and community characteristics

- Level of parental support
- Availability of study centers
- Quality of nutritional care

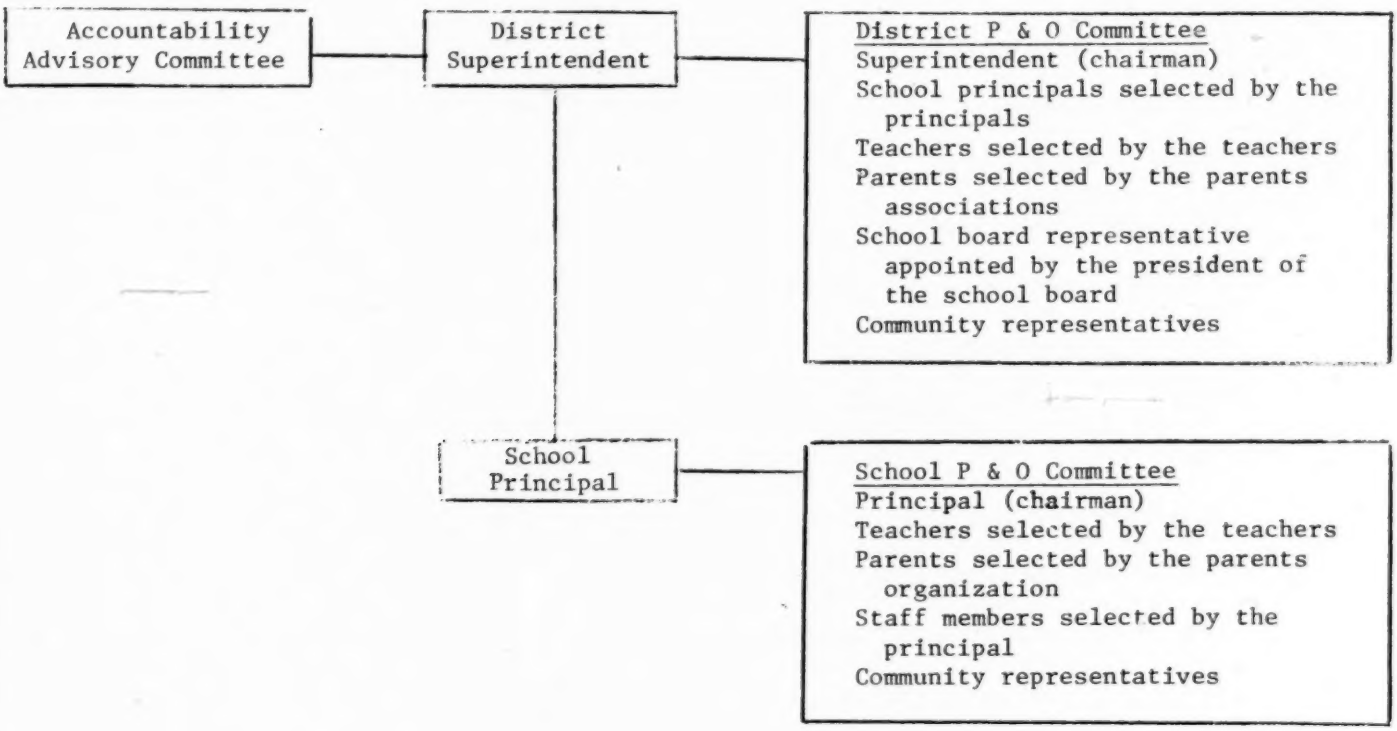
Table 2

A Sample Checklist for a Plan for Corrective Action

Identification of Needs & Goals
Student target population
Personnel required
Staff performance objectives
Additional materials, equipment, facilities required
In-service training requirements
Schedule of activities
Scheduled periodic progress reports
Additional budget required
Involvement of parents and citizens
Monitoring and evaluation plan
List of activities and a rationale for the changes

Table 3

An Example of the Composition of the P & O Committees


Accountability Advisory Committee
District Superintendent
District P & O Committee
Superintendent (chairman)
School principals selected by the principals
Teachers selected by the teachers
Parents selected by the parents associations
School board representative appointed by the president of the school board
Community representatives
School Principal
School P & O Committee
Principal (chairman)
Teachers selected by the teachers
Parents selected by the parents organization
Staff members selected by the principal
Community representatives

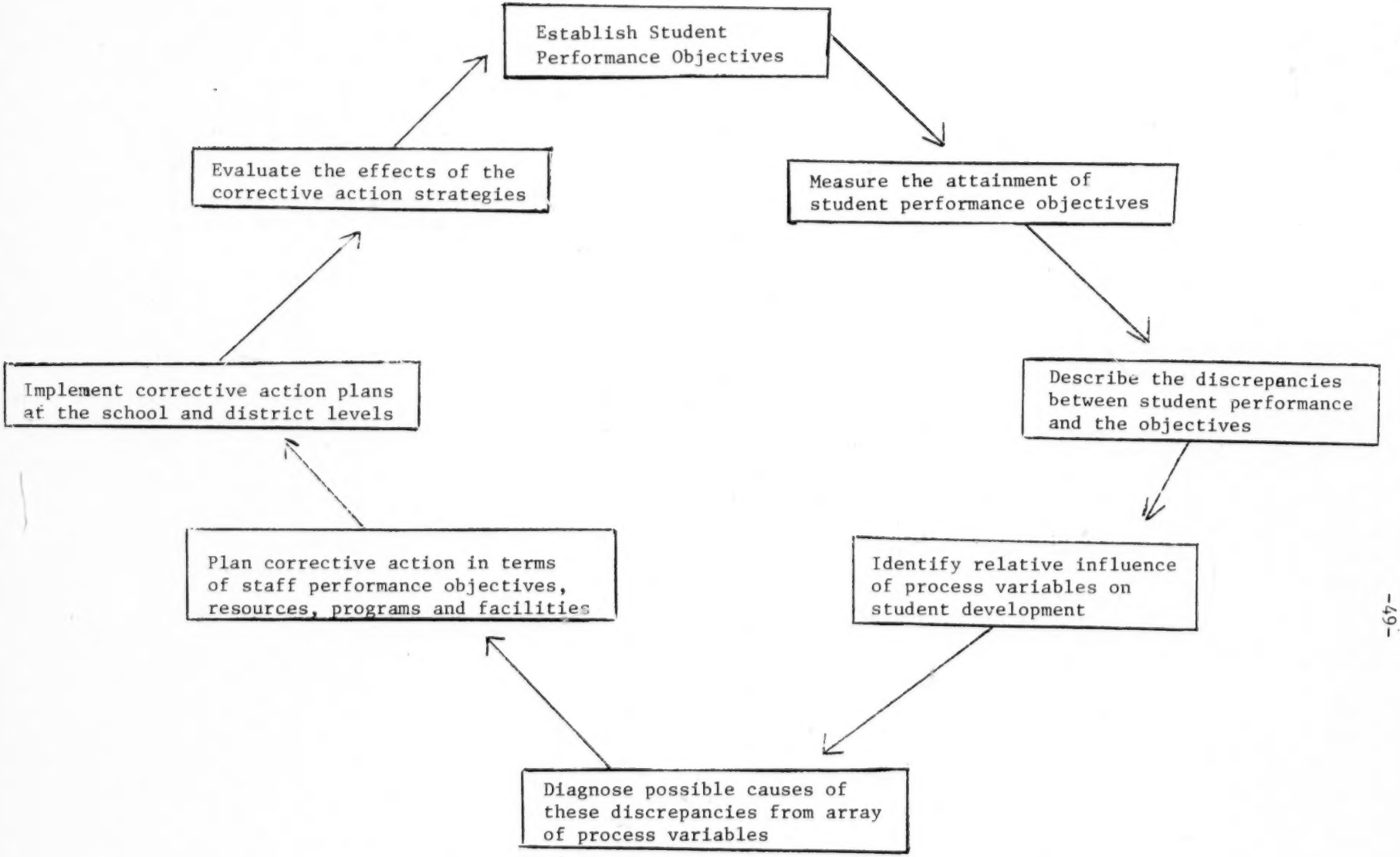

Establish Student Performance Objectives
Measure the attainment of student performance objectives
Describe the discrepancies between student performance and the objectives
Identify relative influence of process variables on student development
Diagnose possible causes of these discrepancies from array of process variables
Plan corrective action in terms of staff performance objectives, resources, programs and facilities
Implement corrective action plans at the school and district levels
Evaluate the effects of the corrective action strategies

Figure 1. The Components of the Accountability System

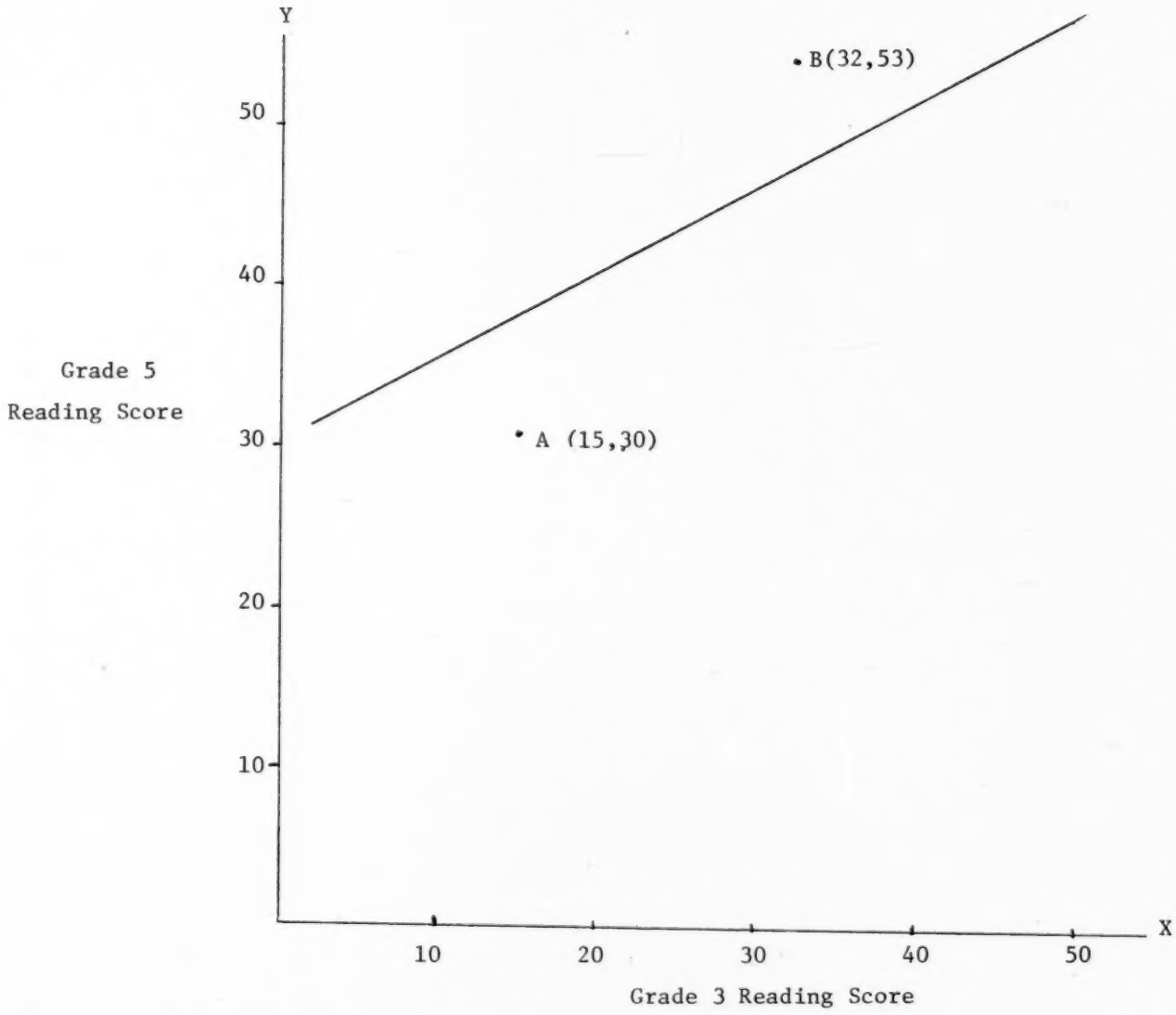


Figure 2. A hypothetical example of a system-wide regression equation.